E/CONF.39/C/406
26 Oct.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: C.7.2

Romania

TECHNICAL AND SCIENTIFIC METHODS IN FORESTRY

By Eng. N. CELAC,
Adviser in the State Committee
for Planning

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

4. Papers and summaries will not be available for general distribution in advance of the Conference. They will be published in advance in limited quantities only for the use of delegations of participating governments and of other authorized participants. Post-Conference publication and general distribution of the Conference Proceedings will follow United Nations practices as laid down by the United Nations Publications Board.

TECHNICAL AND SCIENTIFIC METHODS IN FORESTRY

By
Eng. N.Celac, Adviser in the State Committee
for Planning

1. The usefulness of discussions concerning the scientific and technical methods applied in forestry is accounted for by the importance of forests in the economic development of most countries. Being one of the main natural resources, the forests represent not only an important source of raw materials (woody and other products) which can be processed in many industrial branches, but also play an important hydrological, anti-erosional and sanitary-esthetic role, contributing to the hydroenergetic potential and irrigation of water bodies, to efficiently enhancing the value of light erosionable areas, to improving the sanitary standard of industrial and urban centers as well as to the beauty of landscapes. Being on the whole a public ownership, the forests imply a careful management in accordance with the national economy requirements of the developing countries.

2. Starting from the fact that woody area management in accordance with the technical and scientific requirements represents a main element for the preservation and economical exploitation of this natural resource, we intend to present here some aspects of the methods of solving this problem, used in the Rumanian People's Republic. We must however specify that this experience is closely related, on the one hand, to the natural specific conditions in our country and, on the other, to the fact that our economy is a socialist and a planned one, offering the most favourable conditions for solving the problems raised by the scientific and technical methods used in forestry, within the general plan of national economy development.

3. On account of her geographical position [a] and oropedoclimatic conditions [b] the Rumanian People's Republic has a woody area with numerous species and valuable timber. The cover of spontaneous vegetation shows altitudinally and partly latitudinally a large range of forest phytocenoses, beginning with those specific to the warm forest steppe up to those which bound the alpine meadows.

4. In the territories of the warm forest steppe the stands are com-

---

[a] Geographic position: between about 43°-48° northern latitude and about 2o°-29° eastern longitude.

[b] Oropedoclimatic conditions; a central mountain square (up to 25oo m. altitude), having an inner plateau and hills and exterior plains. Temperate-continental climate, with altitudinally varying temperatures between 11.6 and -2.6° and precipitations of about 3oo-15oo mm (mean annual values). The soil types vary from chernozems, boggy soils and sands in the plain to alpine meadow soils.

9. In our country the forest management on a sylvicultural basis has started in the first half of last century. Howeverm until the end of the second world war an irrational system of forest management was carried out, with tremendous damages for the national economy. A proper policy of managing the forest fund has begun to be fulfilled only after the establishment of people's power, when all the forests have become a social wealth (1948) and best conditions have been created for their managament on a scientific basis, corresponding to the requirements of our fast developing national economy.

10. The necessity of knowing as much as possible the extension, structure and productivity of our present forests, on the one hand, and the breeding and harvesting methods which ensure a constant increase of the productivity of the forest patrimony, on the other hand, has imposed a coordinated development of some very important technical and scientific studies.

11. In order to know our national wooded area , managements have been carried out in a unitary system in the period 1948-1955 (an annual average of 800,000 ha), followed by revisions of 10 year cycles. This work of big proportions required large and various scientific researches. In order to map the woody vegetation, the natural types of forests were investigated, identified and classified, drafting the types for the corresponding determination (242 types). In order to know the structure, size, growth and quality of stand growing stock, inventory methods based on researches and general volume tables (for 16 main species), sorting tables (for 12 species) and yield tables (for 13 species) for the even-aged stands were worked out, while for the uneven-aged stands only volume tables (for 3 species) and quality class tables (for 3 species) were drawn up. For the land organization of the production process, a sub-division of forests by large forest units was established while for the time-based organization -with continuity- of the same process, management methods for the regular high forest, high selection and coppices were drawn up.

12. The management of forests is carried out by a special Design Institute, and the research work is done by the Forest Research Institute. All these results represent the scientific bases of forest management.

13. a) In order to understand these problems it is necessary to specifiy that after the second world war, the new regime established in our country has inherited large areas of non-regenerated forests with stands cut at random and understocked. Since 1950, about 60,000 to 80,000 ha have been reforested yearly as compared with 30,000 ha of annual felling areas intended to be artificially regenerated.

b) By this sustained action of reforestation, a level of 94 per cent of the whole wooded area was reached by 1960.

14. This action had also to be based on scientific researches. Firstly, and due to the higly varied oropedophytoclimatic situation, the conditions for using seeds from other regions had to be set up in order to obtain sound stands of high productivity. As a result of the investigations made a new redistribution of the foresting material all over the country was elaborated. For ensuring the use of the best quality seeds and of valuable ecotypes only limits have been set up for seed reservations and conditions have been imposed that, before being used in nurseries or for direct sowing, each lot of seed must be provided with an analysis report, while in case of transfer it should be accompanied by an origin certificate. The analyses are made in five regional laboratories of the Forest Research Institute, according to the provisions of a State Standard.

posed of species of Quercus (pubescens, pedunculiflora and robur).

5. Within the forest area, the componence of woody vegetation varies according to relief zones as follow :

a) in the plain area we find pure or mixed stands of Quercus species (cerris, frainetto, robur) with other species of valuable hardwoods as : Tilia tomentosa, Fraxinus excelsior, Carpinus betelus, Ulmus campestris Acer sp. and others, as well as the natural riparian forests along the rivers and the Danubian banks, with Salix Alba and Populus;

b) in the hilly area the forests consist, in most cases, of Fagus silvatica and Q. sessilis, while in the warmer western areas of Q.cerris and frainetto and in a lower proportion of a mixture of these species with other hardwood species;

c) in the mountain area the structure of forests varies according to altitudine beginning with stands of Fagus silvatica, which reach an altitude of 1400 m above sea level and continuing with transition stands of pure Abies alba or mixed with Fagus and Picea. Then follow the pure stands of Picea, reaching an altitude of 1860 m above sea level.

6. Taken on the whole, the forests consist of the following species according to the areas occupied by the main species: 24.1 per cent of softwoods (Picea + Abies); 34,3 per cent of beech; 20.1 per cent of Quercus species and 21.5 per cent of other species. The extension of forests according to relief areas varies considerably: in the mountain regions (altitudes of about 700 m above sea level) about 54 per cent, in the hilly regions (altitudes of about 150-700 m above sea level) about 22 per cent and in the plain area (altitudes of about 150 m. above sea level) about 8 per cent. Thus, about 85 per cent of the total wooded surfaces of our country are situated in the mountain area, which has defined the orientation of the territorial organization of the activity regarding harvesting and industrial processing of wood in this area.

7. In oropedoclimatic conditions, particularly favourable to the forest vegetation, some valuable ecotypes of high productivity and quality of wood have resulted. There are regions frequently covered by natural uneven-aged stands of fir, with individuals of over 100 cm breast height diameters and heights of over 50 m, containing between 900 - 1300 cubic meters per ha (Viforîta-Penteleu, Piatra Arsă-Sinaia and others). There are also even-aged stands of fir which at an age of 95 years have a basal area at breast height of about 70 sq.m. and a corresponding volume of about 1000 cu.m. (Poiana Tapului-Valea Prahovei). In the northern regions of the country there are plantations of spruce which at an age of 50-60 years reach an average height of over 35 m (Valea Bîrgăului, and so on). From the dimensional point of view, these stands exceed by far the first class of productivity of Central and Western Europe. In the northern regions of the country, we also find the largest forests of sounding-wood spruce in Europe (Moldoviţa, Valea Putnei, etc.) which have been known for about one century on the world market for the exceptionally high quality of the wood. In other regions we find ecotypes of particularly valuable oak (Quercus sessiliflora), some of European renown (Ronişoara), the wood of which possesses physical and mechanical proprieties superior to those known in the foreign technical literature.

8. All these stands with the above mentioned ecotypes are protected and looked after, some of them constituting scientific or seed reservations. The seed production exceeds the country's needs leaving large quantities to be exported to the interested countries.

15. The work in nurseries follows rules set-up by researches,regarding : pedoclimatic and agro-techinal conditions, density of sowings,tending methods and control of forest damaging factors, conditions for skidding and classification of seedlings by quality (according to a State Standard) as well as the mechanization of works. In some nurseries the mechanization has reached a level of 85 per cent which resulted in a considerable reduction of expenses.

16. a) Reforestation is preceded by a site mapping carried out by the Forest Design Institute. As a result of researches both compulsory formulae and schemes for reforestation per site units and the way of organizing the work-yards have been established. In order to increase forests productivity in our country great attention is paid to the acclimation of exotic species and to the introduction of the most productive ones in forest cultures. The Experimetal Stations of the Forest Research Institute have dendrological gardens where hundreds of exotic species are cultivated some of which were earlier or later introduced in our forest cultures. Among these we mention the following :

b) Robinia pseudaccacia proved to be a high productive species on our fluvial and continental moving sands. At present,over 6o,ooo hectares of these lands are covered by locust forests which at an age of 3o years yield between 118 cu.m. (5th quality class) and 514 cu.m.(1st quality class) per hectare and an average of about 3oo cu.m. of which up to 75% is processing timber. Wide regions of mobile sands have thus been reclaimed. The locust wood with its characteristics similar to oak, is used in mines,for telephone poles, building timber,etc.

c) Euramerican poplars known in our country for about 5o years, have been grown on large areas only after 195o. At present, about 3o,ooo ha along the river and Danube banks are planted with these hybrids and by 1965 their extension will reach an area of over 5o,ooo ha. ensuring an annual yield of about 1,ooo,ooo cu.m. In the past frequent plantations were cultivated on a 2x2 m basis in order to obtain raw material for pulp,particle - and fibreboard industries. The productivity of the existing stands is impressive. The average annual growth at the age of 2o years varies between 3o cu.m.(1st quality class) and 8.5 cu.m.(5th quality class) with an average of 18 cu.m. There are frequent cases when the above mentioned maximum growth is exceeded. Thus, a stand situated at an altitude of 6oo m (Albeşti-Argeş) planted on the 2x2 m basis, presents at the age of 12 years a mean breast height diameter of 18.8 cm, an average height of 24.8 m, a total volume of 39o cu.m. per ha and an annual average growth of 32.5 cu.m.

d) Researches carried out by the Experimental Station for Poplars of the Forest Research Institute have established the existence,in our country, of the following poplar hybrids : "serotina", "marilandica", "regenerata", "rubusta","generosa" . At this station selection and multiplication of both native and exotic valuable hybrids are carried out as well as researches concerning the cultures in nurseries. From the native ones the following were selected :

i) Populus "serotina" - Brăila, clones R_1, R_3 and R_4

ii) Populus "robusta" - Hîrşova, clones R_{13}, R_{16}, R_{18} and R_{2o}

iii) Populus "Robusta" - Oltenița

iv) Populus "regenerata" - Celei

v) Populus "grandis" - Argeş

e) All these clones, introduced in forest plantations during the last few years, are perfectly adapted to the climatic conditions specific to plantation regions in the Rumanian People's Republic; they resist to floods for 15o to 18o days and yield wood of a high quality suitable for peeling, having fibres of average length (fron 1,ooo to 1,5oo microns) and a cellulose content from 51 to 53 per cent. From 1961 onwards, in all our nurseries only mother plants derived from the cuttings of the hybrids selected and produced by the Poplar Station are cultivated.

f) Pseudotsuga menziesi has been introduced in plantations as clumps, hursts or small stands, beginning from an altitude of 7o m up to 1,43o m. It is growing very well in the western half of the country,in the hilly regions (35o to 75o m altitude) of a continental mild climate. It has an average annual growth between 14 and 19 cu.m. per hectare,exceeding by 5o to 1oo per cent the productivity of our native species which it is mixed with. The wood is suitable for building timber, furniture, plywood, particle-and fibreboards, pulp and paper.

g) Pinus strobus is occuring in stands at altitudes varying between 8o m and 97o m. The best results have been obtained at altitudes from 25o to 6oo m, with rainfalls of at least 6oo mm. At the age of 5o to 6o years the average annual growth is of 12 to 16 cu.m.per hectare,exceeding by 4o to 8o per cent the growth of the associated species. The wood is suitable for building timber, carpentry, furniture and particle and fibreboards.

17. The existence in our country of wide regions with a draughty climate has given the opportunity to establish the most suitable sorts of wood species and the adequate techniques of afforestation. As for the afforestation of the steppe regions with degraded chernozems the best results were obtained by sowing in grouped nests Quercus pedunculiflora, cerris and borealis, mixed with Acer pseudoplatanus, Robinia pseudaccacia and Caragana arborescens. At the age of 1o years important harvests of wood were obtained by the extraction of locust trees with 8 to 18 cm. breast height diameter and 12 m height. After another 3 years the shoots of these species attained the same height as the other species (7-8 m). These stands are growing rapidly and produce wood even in the early age.

18. Experimental plantations as shelterbelts, intended to protect agricultural and forest cultures, urban and industrial centers against the severe climate and the roads against the deposits of snow, have contributed to develop both the formulae and schemes of afforestation and the instalment conditions and mechanical tending.

19. a) The great variety of forest types in the Rumanian People's Republic and the rapid transition from primary forests to second growth has raised various and complex problems for our forest management as concerns the control of animal and vegetal pests. The rather frequent bulkywindfalls of spruce have imposed important protective work to be carried out as well as the control of Ipidae. The apparition of the attacks with Lymantria dispar on oak and with Lymantria monacha on spruce has given the opportunity for developping a large research and control work. Special attention was given to the developping of an efficient warning and foresight system.

b) The minimum density of the insects L.monacha, L.dispar and Tortrix viridana - producing mass-leaf dropping - was established by research work, while for preventing their evolution and fecundation phases, the dynamics of sex-ratio, the weight of pupes, the number of deposited eggs, the percentage of parasits, etc.,were established. On this basis special prescriptions were drwn-up for some elements of prognosis as well as the

rules for the minimum sanitary measures for various types of forests.

2o. Simultaneously with the measures intended to identify the attacks, measures were taken for establishing - on a scientific research basis -the control techniques and the most efficient insecticides, helping our chimical industry to manufacture a series of products, some for airplans spraying and others for being used as hot and cold fumes or repulsive compounds against insects brought by the wind - which have been applied with good results.

1383 E - Nov.1962 - 1,600